

other species, both bivalent-formers and complex structural heterozygotes, are self-compatible and largely autogamous.

Oenothera falfurriae W. Dietrich & W. L. Wagner, sp. nov. TYPE: Grown from seeds and cultivated in the Botanical Garden of Düsseldorf, Germany, 2 July 1981, cult. no. 81-115 from seeds collected in U.S.A. Texas: Brooks Co., 13.3 mi. S of junction of Highways 281 and 285 in Falfurrias, 10 May 1978, K. Allred & R. Shaw 2021 (holotype, MO-3332203; isotypes, DUSS, M, MO).

Herbae annuae, erectae vel parum decumbentes, rosulae foliis paucis, 1–4 dm altae. Folia partita vel breviter dentata vel quasi integra. Gemmae erectae. Tubi florales 2.5–4 cm longi, villosi et glanduloso-pubescentes. Sepala 1–2.2 cm longa, viridi-flava, immaculata vel rubromaculata; apices sepalorum minuti, 0.5–2 mm longi. Petala 1.3–2.5 cm longa, flava vel pallide flava. Capsulae 2–4.5 cm longae, 2–2.5 mm crassae, strigillosae, villosae et glanduloso-pubescentes. Semina 0.8–1.4 mm longa, 0.3–0.6 mm crassa. Numerus gameticus chromosomaticus, $n = 7$; planta chromosomatiace structuraliter homozygotica, autocompatibilis.

Erect to decumbent annual herbs, forming a rosette with only a few leaves; stems 1–4 dm long, usually simple, densely to sparsely strigillose, villous and sometimes also glandular puberulent. Rosette leaves oblanceolate, 5–12 cm long, 1.3–3.5 cm wide, dentate to pinnatifid or sometimes subentire, the apex acute, gradually narrowed to a short petiole; cauline leaves narrowly oblanceolate to elliptic or narrowly lanceolate, 2–8.5 cm long, 1–3 cm wide, usually dentate, occasionally pinnatifid or subentire, the apex acute, gradually narrowed to subsessile base; bracts elliptic, narrowly ovate to lanceolate, 2–4.5 cm long, 0.5–2.5 cm wide, dentate or subentire to pinnately lobed, narrowed to the base, subsessile; all leaves densely to sparsely villous and glandular puberulent, especially on the midrib of the lower surface and along the margin, usually also sparsely to moderately strigillose. Inflorescence lax, simple or with lateral branches, usually only 1 flower per spike opening near sunset each day, erect at anthesis. Floral tube 2.5–4 cm long, densely to sparsely villous and glandular puberulent. Mature buds lanceoloid to narrowly ovoid or oblong-ovoid, 0.4–0.6 cm diam.

at the base. Sepals green to greenish yellow, sometimes with red spots, the pubescence as on the floral tube, 1–2.2 cm long, the sepal tips 0.5–2 mm long, erect in bud, strigillose and villous. Petals yellow, broadly obovate, 1.3–2.5 cm long, 1.4–2.7 cm wide, the apex truncate to slightly retuse. Filaments 10–17 mm long; anthers 4–5 mm long; pollen ca. 90–100% fertile. Ovary 1–1.7 cm long, ca. 1.5 mm diam., densely villous, strigillose and glandular puberulent; style 3.5–5 cm long, the visible part 1.2–3 cm long; stigma usually elevated above the anthers at anthesis, the lobes 3–7 mm long. Capsule cylindrical, 2–4.5 cm long, 2–2.5 mm diam., the surface pitted. Seeds brown, ellipsoid, 0.8–1.4 mm long, 0.3–0.6 mm diam. Self-compatible, modally autogamous. Gametic chromosome number, $n = 7$ (7_{II} at meiotic metaphase I).

Oenothera falfurriae, named after Falfurrias, Brooks County, Texas, where the type was collected, is endemic to open sandy sites in southeastern Texas. Its range is nearly the same as those of *O. bifrons* and *O. mexicana*. When Dietrich first detected the species, the specimens were treated as hybrids between *O. grandis* and *O. laciniata* since they were somewhat intermediate between these species. Seed samples collected by K. Allred and R. Shaw made it possible to cultivate this species at the Botanical Institute in Düsseldorf, and it soon became obvious that the plants were by no means hybrids, but instead represented an undescribed bivalent-forming species. All plants examined formed 7_{II} in meiosis, and no individuals grown from seed resembled either *O. laciniata* or *O. grandis*. The individual collection numbers of Allred and Shaw represent population samples of several plants from which seeds were taken and sowed separately: 2016, 2020, and 2021 contained *O. falfurriae* and *O. laciniata*; 2018 contained *O. falfurriae* and *O. mexicana*. Seeds taken from plants of *O. falfurriae* produced only *O. falfurriae* and those of *O. laciniata* produced only *O. laciniata*.

Oenothera falfurriae differs from *O. grandis* in its self-compatibility and smaller petals, which are intermediate in size between those of *O. laciniata* and those of *O. grandis*. Stigmas in the closed mature buds are only slightly raised above the anthers, suggesting that self-pollination is common in *O. falfurriae*. Also, the shape of the buds is more or less oblong, in contrast with the lanceoloid buds of *O. grandis*, and the sepals in *O. falfurriae* are very delicate and pressed to-

gether in bud, whereas in *O. grandis* they are often spreading, longer, and thicker.

Oenothera falfurriae is narrowly distributed and presumably relictual. It appears to maintain itself distinct from the other species of series *Raimannia* with which it grows sympatrically—*O. grandis*, *O. laciniata*, and *O. mexicana*—by possessing a unique plastome. Artificial crosses made by Dr. Behn at the Botanical Institute in Düsseldorf showed that crosses between *O. drummondii* or *O. humifusa* and *O. falfurriae* as the staminate parent produced pale seedlings that failed to grow beyond the cotyledon stage. Similarly, the seeds of crosses between *O. grandis* and *O. falfurriae* did not germinate at all (Behn, pers. comm.). Also, since crosses between *O. drummondii*, *O. humifusa*, or *O. grandis* and *O. laciniata* produce completely green and viable offspring, we can assume that similar crossing barriers exist between *O. falfurriae* and *O. laciniata*, based on the pattern of such relationship in *Oenothera* sect. *Oenothera* generally.

***Oenothera drummondii* Hook. subsp. *thalassaphila* (Brandege) W. Dietrich & W. L. Wagner, comb. nov.** Based on *Oenothera thalassaphila* Brandege, Univ. Calif. Publ. Bot. 10: 185. 1922. *Oenothera drummondii* Hook. var. *thalassaphila* (Brandege) Munz, Amer. J. Bot. 22: 651. 1935. TYPE: Mexico. Baja California Sur: San José del Cabo, 12 Mar. 1892, T. S. Brandege 218 (lectotype, UC-107674; see Munz, Amer. J. Bot. 22: 651. 1935).

The separation of *Oenothera drummondii* subsp. *thalassaphila*, which is restricted to dunes of coastal southern Baja California del Sur, Mexico, from subsp. *drummondii* depends on a combination of characters since no single morphological feature separates them clearly. *Oenothera drummondii* subsp. *thalassaphila* always grows

for several years, as is demonstrated by the consistent presence of nonflowering shoots and large taproots on the older plants. By contrast, *O. drummondii* subsp. *drummondii* is basically an annual, seldom overwintering for a second season; it usually has only a few nonflowering shoots or none, and the development of its taproot is considerably weaker than in subsp. *thalassaphila*. In general, the habit of subsp. *drummondii* is more upright than that of subsp. *thalassaphila*, which has prostrate to ascending stems. In addition, the calyx of subsp. *thalassaphila* often has red spots and lacks glandular hairs, whereas the calyx of subsp. *drummondii* only rarely has reddish spots and is often glandular puberulent. The sizes of the capsules and seeds are also modally distinct: in subsp. *thalassaphila* the capsules are 2–4 cm long and 2.5–5 mm in diameter, and the seeds are 1.5–2 mm long and 0.7–0.9 mm in diameter; in subsp. *drummondii* the capsules are 2.5–5.5 cm long and 2–3 mm in diameter, and the seeds are 1.1–1.7 mm long and 0.5–0.8 mm in diameter.

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A NEW COMBINATION AND NEW SUBSPECIES IN *OENOTHERA ELATA* KUNTH (ONAGRACEAE)¹

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ABSTRACT

The new combination of *Oenothera elata* Kunth subsp. *hookeri* (Torrey & A. Gray) W. Dietrich & W. L. Wagner is made for plants of moist coastal or slightly inland sandy and bluff sites from Marin County south to San Diego County, California, previously known as *O. hookeri* subsp. *hookeri* and subsp. *montereyensis*. Also, *O. elata* subsp. *texensis* subsp. nov. is described from Brazos County, Texas. It appears to be a rare relictual entity most closely related to *O. elata* subsp. *hirsutissima* which occurs disjunctly some 680 km to the west of subsp. *texensis*.

These names are made available in anticipation of their use in regional floras and concurrent studies of flavonoids, cytology, and pollen morphology in advance of a detailed revision of *Oenothera* subsect. *Oenothera* (Dietrich & Wagner, in prep.). Detailed presentation of data and discussions will be given in the revision.

Munz (1949, 1965) divided the large-flowered, bivalent-forming, outcrossing populations of sect. *Oenothera* subsect. *Oenothera* from the western United States south to Panama into two species, *O. hookeri* Torrey & A. Gray and *O. elata* Kunth. During the past ten years we have reevaluated the variation pattern of these plants by a detailed study of a large number of herbarium specimens, fieldwork, and study of plants cultivated in the experimental gardens at Düsseldorf. These studies have shown that the two entities are extremely similar and differ only in bract shape, capsule diameter, and modally in several other features. It was therefore suggested by Raven et al. (1979), in an outline of the systematics of *Oenothera* sect. *Oenothera* subsect. *Oenothera* (formerly *Euoenothera*), that they should be considered conspecific.

Oenothera elata can be subdivided into four subspecies: subsp. *elata* with a scattered distribution from Guanajuato, Mexico, to Costa Rica and Panama in Central America; subsp. *hirsutissima* (A. Gray ex S. Watson) W. Dietrich, which occurs in the western United States from Washington and Oregon south to northern Baja California and Durango, Mexico, and in Kansas, Oklahoma, and western Texas (Dietrich in Wagner, 1983); subsp. *texensis* subsp. nov., known only from one collection in Brazos County, Tex-

as; and subsp. *hookeri* (Torrey & A. Gray) comb. et stat. nov. occurring in moist coastal and slightly inland sandy and bluff sites in California from Marin County south to San Diego County.

The four subspecies of *Oenothera elata* can be distinguished with the following key.

KEY TO THE SUBSPECIES OF *OENOTHERA ELATA*

- 1a. Stem, leaves, and ovary (capsule) exclusively appressed pubescent (strigillose); stem rarely with scattered pustulate hairs (muricate).
 - 2a. Stem flushed with red; the free tips of the capsule distinct subsp. *hirsutissima*
 - 2b. Stem usually green; the free tips of the capsule indistinct.
 - 3a. Mature buds (excl. floral tube) narrowly lanceolate in outline, 3.5–5 cm long; sepal tips 2–3 mm long; petals 4.5–5.5 cm long; capsule 5–6.5 cm long; bracts undulate; leaves membranous; plant in cultivation up to 20 dm tall subsp. *texensis*
 - 3b. Mature buds (excl. floral tube) lanceolate in outline, 2–3 cm long; sepal tips 1–2 mm long; petals 2.5–3.5 cm long; capsule 2.5–4 cm long; bracts plane, leaves somewhat leathery; plant in cultivation not more than 10 dm tall subsp. *elata*
- 1b. Stem and ovary (capsule) predominantly with erect pubescence (short and long villous), stem usually with pustulate hairs (muricate) and in the region of the inflorescence with glandular hairs (glandular puberulent).
 - 4a. Stem in the region of the inflorescence without glandular hairs subsp. *hirsutissima*
 - 4b. Stem in the region of the inflorescence with glandular hairs.
 - 5a. Sepals green or flushed with red, without or with indistinct pustulate hairs, sparsely to scattered villous;

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- plant in cultivation more than 10 dm tall subsp. *hirsutissima*
 5b. Sepals always flushed with red, with distinct red pustulate hairs, usually densely long villous; plant in cultivation not more than 8 dm tall subsp. *hookeri*

The plants described here as *O. elata* subsp. *texensis* are known only from a single herbarium specimen and from material cultivated at Düsseldorf. In 1981 Dietrich collected a seed of an unusual *Oenothera* from a TRT herbarium specimen. From the large flowers it appeared to represent *O. grandiflora* L'Hér., but when plants were grown in Düsseldorf they clearly represented *O. elata*. Further, based on its strigillose pubescence it appeared to be subsp. *hirsutissima*; however, other characters clearly separated it from both strigillose pubescent subspecies of *O. elata*, subsp. *elata* and *hirsutissima*. The stems of the Brazos County plants are always green, the capsules are 5–6.5 cm long, the buds are narrowly lanceolate, and the leaves are membranous. These plants grow tall in cultivation, to 2 m or more.

***Oenothera elata* Kunth subsp. *texensis* W. Dietrich & W. L. Wagner, subsp. nov.** TYPE: Grown from seeds taken from herbarium specimen TRT-205991 and cultivated at the Botanical Garden of the University of Düsseldorf, 12 Sept. 1984, cult. no. *Stubbe 84-204*; original source, U.S.A. Texas: Brazos Co., ca. 17 km NW of Navasota River bridge on Hwy. 6 in vicinity of Peach Creek cutoff, 25 Oct. 1978, *P. M. Catling & K. L. Intosh* (holotype, MO-3332204; isotypes, DUSS, M).

Herbae biennes, erectae, in culturam usque ad 20 dm altae. Caules virides, strigillosi. Folia undulata. Gemmae maturae (excl. tubus floralis) anguste lanceolatae, 3.5–5 cm longae. Sepala viridia, strigillosa. Petala flava, 4.5–5.5 cm longa. Stylus longus, stigmatibus supra antheras elevato. Capsulae 5–6.5 cm longae, strigillosae. Numerus gameticus chromosomaticus, $n = 7$; planta chromosomatically homozygotica (7 bivalentia in metaphasium primum meiosis), autocompatibilis.

Munz (1949, 1965) recognized two subspecies of his *Oenothera hookeri* from moist coastal or slightly inland sites in California: subsp. *hookeri* and subsp. *montereyensis*. He referred plants with a bushy habit, blunt buds, free sepal tips 1–2.5 mm long, and sepals usually 2–2.5 cm long to subsp. *montereyensis*, whereas plants with a less branched habit, attenuate buds, free sepal tips 2–4 mm long, and sepals 3–3.5 cm long were referred to subsp. *hookeri*. Our studies have shown that these characters represent intra- and inter-populational variation and, further, appear to vary independently. The bushier habit of some coastal plants appears to be an adaptation to wind and salt spray. All of these populations are here treated as members of one coastal subspecies of *Oenothera elata* distinguished from the other three subspecies of *O. elata* primarily by its densely glandular puberulent and long-villous buds.

***Oenothera elata* Kunth subsp. *hookeri* (Torrey & A. Gray) W. Dietrich & W. L. Wagner, comb. et stat. nov.**

Oenothera hookeri Torrey & A. Gray, Fl. N. Amer. 1: 493. 1840. TYPE: California [without specific locality] *Douglas s.n.* (holotype, GH).

Oenothera hookeri Torr. & A. Gray subsp. *montereyensis* Munz, Aliso 2: 14. 1949. TYPE: United States. California: Monterey Co., 0.2 mi. S of mouth of Alder Creek, 6 Nov. 1934, *C. B. Wolf 6223* (RSA-12778, holotype (not seen); isotypes, GH, NY, POM).

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A REVISION OF *MEZILAURUS* (LAURACEAE)¹

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ABSTRACT

The neotropical genus *Mezilaurus* (Lauraceae), which consists of 18 species and is best represented in the drainage area of the Amazon, is revised. *Clinostemon*, a genus of two species recently separated from *Licaria* and reinstated on its own, is included here in *Mezilaurus*. Eight species, *Mezilaurus caatingae* van der Werff, *M. duckei* van der Werff, *M. glaucophylla* van der Werff, *M. micrantha* van der Werff, *M. opaca* Kubitzki & van der Werff, *M. palcazuensis* van der Werff, *M. pyriflora* van der Werff, and *M. quadrilocellata* van der Werff are described as new. One new name, *M. thoroflora* van der Werff, and a new combination, *M. mahuba* (Sampaio) van der Werff, are published.

Mezilaurus comprises 18 species, occurring from Costa Rica to southern Brazil. The majority of the species are found in the drainage area of the Amazon River and adjacent Guayana. The type species, *M. navalium*, is restricted to the Atlantic rain forests of southern Brazil; two species (of which one remains undescribed due to insufficient material) are shrubs from the cerrado vegetation. Fourteen species are Amazonian and have been reported from a variety of habitats. Ten Amazonian species, ranging from shrubs to tall trees, occur in terra firme vegetation, frequently in xeromorphic forests on white sand. One species, *M. mahuba*, is restricted to flooded forest. Three species are known to occur in secondary vegetation (*M. thoroflora*, *M. synandra* and *M. lindaviana*), although it is not clear whether these are typical of secondary vegetation or were left standing when the primary forest was cut. When cutting primary forest throughout the Neotropics, the local people tend to leave some economically useful species intact for future harvesting. Lauraceae, widely used for timber, are therefore frequently found as isolated trees in pastures or similarly disturbed habitats. No habitat information is available for the Colombian species, which is only known from Chigorodó in northern Antioquia. The Costa Rican species occurs in wet lowland forest near the Pacific Coast.

Most species of *Mezilaurus* are collected infrequently, and I have seen more than ten collections for only two species (*M. itauba* and *M. lindaviana*). That many *Mezilaurus* species are large or middle-size trees and all have small, greenish flowers usually less than 2 mm long no doubt explains the paucity of collections. The

genus is greatly undercollected and much more material is needed for a better taxonomic understanding.

The main use of *Mezilaurus* is for timber. The species are locally well known and their hard wood is much used for boat building and construction. Mez (1889) mentioned that the fruits of *M. itauba* are edible. On the label of Fróes 12152 (*Mezilaurus pyriflora*) it is stated that the wood causes injuries to the skin, presumably a kind of dermatitis.

The present revision was undertaken because it became clear that the genus *Clinostemon* should be merged with *Mezilaurus*. This led to a closer look at recent collections, during which several undescribed species were found. I now recognize 18 species in *Mezilaurus*, which more than doubles the number of species recognized by Kostermans (1938).

MATERIALS

This study is based both on older collections, already cited by Kostermans (1938), and recent collections personally selected during visits to major American and European herbaria or received on loan with other unidentified Lauraceae. In my experience the genus was unrecognized in many herbaria. Unfortunately, I have not yet had the opportunity to visit the leading Brazilian herbaria. I fully expect that such visits will yield additional taxa, not only from the Amazonian forests, but also from the cerrado vegetation and possibly the Atlantic rain forests. Although this study is therefore incomplete, I hope it will kindle the interest of neotropical botanists in this group of small-flowered Lauraceae.

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TAXONOMIC HISTORY

The first species of *Mezilaurus* was published by Allemão (1848) as *Silvia navalium*. Meissner (1864) recognized that *Silvia* Allemão was a later homonym of *Silvia* Vellozo and proposed the new name *Silvaea*. Unfortunately, *Silvaea* Meissner is a later homonym of *Silvaea* Phillipi. O. Kuntze (1891) proposed another new name, *Mezia*, to replace *Silvia* Allemão, but the name *Mezia* O. Kuntze was predated by *Mezia* Schwacke, a genus of Malpighiaceae. Finally, Taubert (1892) proposed the name *Mezilaurus*, which Mez (1892) accepted. He included seven species in the genus. Pax (1897), overlooking the publication of *Mezilaurus*, proposed *Neosilvia* as a new name for *Silvia* Allemão. *Neosilvia* is therefore a superfluous name. The name *Mezilaurus* was not universally accepted at first. Even Mez (1904, 1920, 1924) used the name *Silvia* again. Ducke (1930, 1935) published several new species under the generic name *Silvia*. Kostermans's revision (1938) definitively established the use of *Mezilaurus* Taubert.

During the nineteenth century, several species now placed in *Mezilaurus* were described in other genera, mostly in genera now included in *Licaria*. Meissner (1864) described three species in *Acrodictidium* and one in *Oreodaphne* (a synonym of *Ocotea*). Bentham in Hooker (1878) transferred two of these to *Misanteca* (a synonym of *Licaria*) and Bentham and Hooker (1880) placed the other two (including the type species of *Mezilaurus*) in *Endiandra*, an Old World genus. Mez (1889) recognized six species in *Mezilaurus* (as *Silvia*), the type species, the four species described by Meissner (1864), and a sixth species now included in *Licaria*. Kostermans (1938) accepted eight species of *Mezilaurus*, four of Mez's species and four described since 1889 by Mez and Ducke. Allen (1964) described two new species of *Mezilaurus* from Venezuela.

Kuhlmann and Sampaio (1928) published the monotypic genus *Clinostemon* based on *Acrodictidium mahuba* Samp. Kostermans (1938) did not accept this genus and placed it in *Licaria*. Later Allen (1948) described a new species closely related to *Licaria mahuba* and noted the resemblance to *Mezilaurus*. Recent investigations (Kubitzki et al., 1979) have shown that these two species do not belong in *Licaria* and are more closely related to or congeneric with *Mezilaurus*. In this paper both are included in *Mezilaurus*.

The eight species recognized in Kostermans's

monograph are all maintained in this publication. The increase in the number of *Mezilaurus* species is partly due to the inclusion of *Clinostemon* in *Mezilaurus* and partly due to recent collections that represent undescribed species.

GENERIC RELATIONSHIPS

One of the main taxonomic difficulties in Lauraceae is that many of the genera are poorly defined. This is reflected in the various infrafamilial classification schemes and the frequency with which species are transferred between various genera. During the last 30 years generic relationships within the Lauraceae have been discussed in three papers (Kostermans, 1957; Hutchinson, 1964; and Richter, 1981).

Kostermans (1957) attached much importance to the fruit (with or without cupule) and less importance to the number of anther cells; he placed *Mezilaurus* in the subtribe Beilschmiedinae of the tribe Perseeae, close to *Endiandra*, and noted, as did Bentham and Hooker (1880), a similarity to *Endiandra*. He also stated that *Endiandra* and *Mezilaurus* differ in anther shape and the positions of their leaves. Additional differences are the very fine reticulation of the leaves and the large, spreading tepals in many species of *Endiandra* (comparable to tepals in *Nectandra*), which are very unlike the small, erect, scale-like tepals in *Mezilaurus*. These differences greatly outweigh the similarities between *Endiandra* and *Mezilaurus* (number of fertile stamens, number of anther cells, fruit more or less without cupule) and *Endiandra* is probably not a close relative of *Mezilaurus*.

Hutchinson (1964) considered the number of anther cells more important than the development of the cupule. He placed *Mezilaurus* next to *Misanteca*, but the distribution data given under *Misanteca* strongly suggest that Hutchinson, as did Bentham and Hooker (1880), included in his *Misanteca* two Brazilian species here included in *Mezilaurus*.

As can be seen from the taxonomic history of *Mezilaurus*, its species frequently have been placed in *Licaria* (or its synonyms *Acrodictidium* and *Misanteca*). These two genera have in common that they are the only neotropical Lauraceae with three fertile, two-celled stamens. The general flower shape of species belonging to these two genera can be quite similar and a generic separation based solely on flowers can be very difficult. Fortunately, other characters readily

identify the genera: *Mezilaurus* has the leaves always clustered at the tips of the branches, *Licaria* never; in *Mezilaurus* the cupule consists of a small, platelike disk, in *Licaria* it grows into a rather large, double-rimmed cup, and the inflorescence of *Mezilaurus* is a double raceme (Figs. 3, 8C), an inflorescence type never found in *Licaria*. Kubitzki et al. (1979) partly enumerated these differences and discussed the placement of *Licaria mahuba* (Samp.) Kostermans and *L. maguireana* Allen. They concluded that these species did not belong in *Licaria* and resurrected the generic name *Clinostemon* to accommodate them. *Clinostemon* was considered a close relative of *Mezilaurus*, the only difference being the presence of staminodia in *Clinostemon* and their absence in *Mezilaurus*. The two *Clinostemon* species also share large, obovate leaves with an abruptly rounded base.

The taxonomic importance of absence/presence of staminodia in defining genera of Lauraceae is open to discussion. In some genera staminodia are consistently present (*Persea*, *Phoebe*); in others they may be present or absent (*Aiouea*, *Aniba*, *Licaria*, *Ocotea*). This suggests that a generic separation based only on presence/absence of staminodia is weak, especially because the staminodia are small, ca. 0.5 mm, and not easy to find. The discovery of two undescribed species in Colombia and Costa Rica with the leaf shape and size of a *Mezilaurus*, but with staminodia like *Clinostemon*, is another reason to place *Clinostemon* in synonymy under *Mezilaurus*.

Richter (1981) amply discussed the wood and bark anatomy of the Lauraceae. He found that within the Lauraceae, *Mezilaurus* occupied an isolated position and was easily recognized both on wood and bark characters. He also found that the wood (bark was not available) of the two *Clinostemon* species was either undistinguishable or very similar to *Mezilaurus* and suggested that *Clinostemon* should be placed very close to *Mezilaurus*, or merged with it, a conclusion he published earlier in Kubitzki et al. (1979). The great similarity in wood anatomy plus the isolated position of *Mezilaurus/Clinostemon* in the Lauraceae is the second reason to merge these two genera. Richter (1981) also found that *Licaria* and *Endiandra* are, as far as wood anatomy is concerned, not closely related to *Mezilaurus*. The genus most closely related to *Mezilaurus* by wood characters is *Anaueria*, a monotypic genus incompletely known from a few collections in Brazil and Peru. Kostermans (1952) and Hutch-

inson (1964) both placed *Anaueria* in *Beilschmiedia*; Kostermans mentioned, without giving details, that he did so as a result of studying additional herbarium material from Rio de Janeiro. Neither *Anaueria* nor *Beilschmiedia* is likely to be confused with *Mezilaurus*, since they have flowers with six or nine fertile stamens and never have clustered leaves.

Two species described in this paper merit additional comments. *Mezilaurus quadrilocellata* and *M. glaucophylla* have an unusual distribution, being only known from northern Colombia and Costa Rica. All other *Mezilaurus* species occur in the Amazonian forests or other parts of Brazil. Secondly, *M. quadrilocellata* and *M. glaucophylla* have staminodia (as do the species formerly placed in *Clinostemon*) and the leaf shape of *Mezilaurus* species (quite unlike the species formerly included in *Clinostemon*). Thus, they link *Mezilaurus* with *Clinostemon*. Moreover, they are the only species in the genus with four anther cells on each stamen. Given the importance frequently attached to the number of anther cells and the number of fertile stamens, the presence of three four-celled anthers (not found in any other New World Lauraceae) could be sufficient for the recognition of a new genus. However several other genera include species with two-celled and four-celled anthers, and because other characters (leaves clustered at branch tip, shape of the inflorescence) point toward *Mezilaurus*, I include these species in *Mezilaurus*.

As a result of the transfer of *Clinostemon* and the inclusion of *Mezilaurus quadrilocellata* and *M. glaucophylla*, my concept of *Mezilaurus* is wider than has been used by previous authors. I regard as diagnostic characters the leaf position (clustered at the tips of branches), the small, platelike cupule (but fruits from most species are not yet known), the type of inflorescence (a double raceme), and the presence of three fertile stamens. Richter (1981) discussed diagnostic wood and bark characters.

In conclusion, *Mezilaurus* shows in floral characters a strong resemblance to *Licaria*. However, these two genera differ in wood anatomy, cupule shape, leaf position, and inflorescence type. Wood anatomy suggests a close relationship between *Mezilaurus* and *Anaueria*, but these two genera differ in characters of leaf position, inflorescence type, and number of fertile anthers. A close relationship between *Mezilaurus* and *Endiandra* is very unlikely. Currently available information indicates that *Mezilaurus*, including *Clinoste-*

mon, is endemic to the Neotropics, and that it occupies an isolated position in the family.

MORPHOLOGY AND TAXONOMIC CHARACTERS

Mezilaurus species range from small trees or shrubs (the cerrado species) to tall forest trees much valued for their timber. The twigs are generally thick, show conspicuous leaf scars, and are often covered with a thick bark layer.

Leaves. The leaves in all species are pinnately veined. The lateral veins frequently arch upward and become connected with the more distal lateral vein. The texture of the leaves is variable; most species have chartaceous leaves, but a few have coriaceous leaves in which secondary and tertiary venation is poorly visible. Conspicuous gland dots in the leaves occur rarely. The leaves generally turn dark upon drying.

Characteristic for the genus is the fact that the leaves are always clustered at the tips of the branches. Young shoots grow initially rapidly without developing leaves; after this elongating period, leaves are formed at the tip of the young branch. Such branches may have several clusters of leaves, representing different growing seasons. I will call this growth pattern long shoot–short shoot. Under unfavorable conditions (several *Mezilaurus* species are reported from white sand forests or caatinga forests) the difference between the long shoots and short shoots becomes less pronounced and the growth pattern may seem a succession of short shoots, with only one cluster of leaves at the tip of the branches. However, I think the difference between long shoot–short shoot or short shoot growth pattern is quantitative, not qualitative.

Species with clustered leaves of the long shoot–short shoot pattern occur regularly, but not frequently, in several other neotropical genera of Lauraceae (*Aniba*, *Endlicheria*, *Nectandra*, *Ocotea*, *Phoebe*, and *Pleurothyrium*). However, only in *Mezilaurus* is this clustered leaf pattern characteristic or dominant. The non-*Mezilaurus* species with clustered leaves are rarely confused with *Mezilaurus*; even in vegetative state they are readily separated by conspicuous pubescence or leaf color differences. Only one species, *Ocotea rubra*, very closely resembles *Mezilaurus* in sterile state. However, its flowers with nine four-celled stamens and fruit with a large cupule make identification easy.

Nearly all species of *Mezilaurus* have elliptic to obovate leaves. The base of the leaves, how-

ever, offers some useful characters. Four species, *Mezilaurus mahuba*, *M. pyriflora*, *M. thoroiflora*, and *M. duckei*, have large leaves (to 60 cm long) which become gradually narrowed toward the base; at the base the leaves are abruptly narrowed, becoming rounded or even cordate. Three species, *M. subcordata*, *M. quadrilocellata*, and *M. glaucophylla*, have an obtuse or rounded leaf base with a distinct petiole, 2–6 cm long. In these three species the leaf shape is slightly obovate or ovate. In all other species (with the exception of *M. crassiramea*), the leaf base is gradually attenuate or decurrent on the petiole. Most of these species have a petiole. Three species, however, *M. caatingae*, *M. crassiramea* and *M. decurrens*, have sessile leaves or nearly so. In some collections of *M. crassiramea* the leaf base is gradually narrowed, in others it is rather abruptly narrowed. In this species the petioles, if present, are less than 1 cm long.

Pubescence. There is not much variation in pubescence within *Mezilaurus*. Two species, *M. crassiramea* and *M. lindaviana*, have erect pubescence on the lower surface of the leaves; this can be quite sparse in *M. lindaviana*, however. The other species have varying amounts of appressed pubescence on leaves, stems, terminal buds, and inflorescences. These varying amounts of pubescence have little diagnostic value.

Inflorescence. The inflorescence of *Mezilaurus* consists of a compound raceme (dibothryum, see Weberling, 1981, 1985). This inflorescence type is present without modifications in *M. crassiramea*, *M. lindaviana*, *M. mahuba*, *M. pyriflora*, *M. thoroiflora*, and *M. duckei*. Short tertiary axes are sometimes present in *M. glaucophylla* and *M. quadrilocellata*. In the other species the inflorescences are smaller and the flowers are not evenly distributed along the lateral branchlets of the inflorescence, but are clustered at the tips of these branchlets. The occasional occurrence of flowers along the branchlets suggests that the clustered flowers are a derived condition. It is worth noting that the species with a well-developed dibothryum have larger (often much larger) inflorescences and have usually smaller flowers than the species with clustered flowers. A dibothryum is a rare inflorescence type among other neotropical Lauraceae (if it ever occurs outside of *Mezilaurus*).

The inflorescence type of one *Mezilaurus* species, *M. decurrens*, is not known due to the fragmentary nature of the single available specimen.